

CONTRIBUTIONS TO THE LIFE-HISTORY OF PLANTS, NO. XVI.

BY THOMAS MEEHAN.¹THE BARTRAM OAK, IN CONNECTION WITH VARIATION AND
HYBRIDISM.

My recent discovery that the mature wood of trees may so change their original lines as to alter the whole form of the skeleton, and that these changes in form are characteristic of the species, may enable us to settle some disputed questions. In the case, somewhat famous, of the Bartram oak, *Quercus heterophylla* Mx., we may now say with absolute certainty that it is but a form of the pin oak, *Quercus palustris*. The angular divergence of the mature branches is the same in both; while other resemblances to the latter species are well known. Much of the confusion in regard to this matter has arisen from the tree, still in the Bartram gardens, that for many years past has been pointed out to botanists as a seedling from the original tree long since destroyed. Specimens from this tree are widely diffused through herbariums. It is but a somewhat lobed-leaved form of the willow oak, *Quercus Phellos*, a condition not infrequent among trees of this species, and of which form there are numerous specimens in the herbarium of the Academy of Natural Sciences of Philadelphia. If any one had thought to compare these specimens with the plate in Michaux's "Sylva," the error would have been noted. Dr. Engelmann was familiar with Michaux's plant only through these misleading Bartram specimens, and hence described his *Quercus palustris-imbriearia*, which proves to be identical with Michaux's *Q. heterophylla*. Dr. Engelmann was led to write positively in regard to the hybridity in a great degree from his belief in the sterility of hybrids—the St. Louis tree producing only a single acorn, so far as any one knew, during

¹ The manuscript of this article was found among the late Mr. Meehan's papers after his death and sent to the Academy for publication by his son, Mr. S. Mendelson Meehan. It possesses a special interest as being the last contribution from one who for nearly forty years enriched the *Proceedings* with the results of his acute and devoted study of nature. Mr. Meehan's first paper in the *Proceedings* of the Academy was published in 1862.—EDITOR.

its existence. From this acorn grew the tree now on my grounds. It is remarkably fertile, wholly destroying the "sterile" idea, even though it were a hybrid, and with the leaves and skeleton characters of *Q. palustris*, as already noted. Seedlings from Delaware trees, the acorns sent by Mr. Commons, a well-known local botanist, all retain the character of occasional entire leaves, but in other respects coincide with *Q. palustris*. While the absence of deep lobing struck Michaux, it is remarkable that he did not note the opposite in other cases.

It is not unusual to note individual trees of *Quercus palustris* with the leaves so deeply incised that there is left little of leaf-blade but the strong veins and midribs. Indeed, this variation in the lobing of leaves may be noted in all species of oak. There is no need to call in hybridism to account for this varying condition. We find in many plants a tendency to have lobed leaves in an early stage and wholly entire at a later. The evergreen ivy, *Hedera Helix*, is a familiar example. We now know that these changes result from varying degrees of growth-energy, and not from any external agency in which hybridism may be included. In the light of modern knowledge, explanations of the past seem remarkable. Referring to *Quercus heterophylla* Michaux says: "Every botanist who has visited different regions of the earth must have remarked certain species of vegetables which are so little multiplied that they seem likely at no distant period to disappear from the earth. To this class belongs the Bartram oak." When we remember that this was said of a young tree, described as "30 feet high and 8 inches in diameter," growing in the midst of numerous pin oak trees of great age, that formed almost the chief oak character of that region, and from which this young tree must have had its origin, one can only surmise that for once Michaux had lost his usual high judicial ability.

The main point of this note is to illustrate by the Bartram oak the value, in settling important questions in long dispute, of the discovery that old wood may change its direction so as to give a specific character to the main branches or skeleton of the tree, and incidentally to show that we gain a great point in biology when we note how striking variations may occur by varying degrees of vital energy, and without calling in the aid of survival, hybridism or of any external agency.

OBSERVATIONS ON THE FLOWERING OF *LOBELIA CARDINALIS*
AND *LOBELIA SYPHILITICA*.

In my garden during the past year, 1900, I had some fifty plants each of *Lobelia syphilitica* and *Lobelia cardinalis* in rows side by side. They were so near each other that some of the flower stems of the latter fell over and seemed to be blooming among the plants of the former. It surprised me one day to note that while numerous winged insects visited the blue-flowered species, none cared for the scarlet ones. This excited an interest that led to a continuous observation through the whole flowering period. At no time did I see an insect visitor on the cardinal flower, while every day the blue-flowered species had abundant attention. On one occasion I found a humming-bird, *Trochilus colubris*, at work on the cardinal flower, and the zest with which numerous flowers were examined by the bird attested to the presence of nectar, a fact which my own test subsequently verified. The bird is not numerous on my ground, and with an abundance of flowers of various kinds over many acres of ground, it may be inferred that it was not a frequent visitor to the cardinal flower. I observed it only on this occasion. It wholly neglected the blue-flowered species, that seemed so attractive to the insects. Toward the end of the season the foreman in charge, Mr. Hemming, captured specimens of all that were visitors to *Lobelia syphilitica* during one day. These were identified by Mr. William J. Fox as follows: *Xylocopa virginica*, *Bombus pennsylvanicus*, *Bombus fervidus*, *Bombus americanorum* var. *pallidus*, *Apis mellifera*, and a sand wasp, *Scolia dubia*. It is worthy of note that the honey-bee did not visit the flowers till late in the season. About fifty yards away from these plants was a large bed of *Sedum spectabile*, which at the earlier stage of these observations were crowded by this well-known honey gatherer. It may be inferred that as long as they lasted they collected all needed from these flowers. Honey-bees at any rate are not numerous in this vicinity.

At the end of the season no difference could be observed in the fertility of the two species. Every capsule seemed abundantly seed-bearing. The presence or absence of insect visitors had no effect. Dissecting the flowers from time to time, and in various stages before and after anthesis, some original and interesting phenomena

were observed. At the period when the anthers have reached their full development a rest is taken, apparently till the next day. Then the style elongates until it seems to be held fast by the united anther cap. After a short rest it is again in motion, the anther-cells burst, and the pollen is ejected so forcibly through the crown as to sometimes cover the scarlet petals with powder. In the case of the blue-flowered species, bees occasionally get a portion of the pollen shower.

Aside from the interesting fact in regard to the forcible ejection of the pollen, and the free fertility under self-fertilization—for, notwithstanding the freedom of insect visitors, *Lobelia syphilitica* is absolutely self-fertilized—note may be taken of differing observations. Of *Lobelia fulgens*, which is essentially identical with *Lobelia cardinalis*, Mr. Darwin says, in his “Cross and Self-fertilization in the Vegetable Kingdom”: “This plant is never visited in my garden by bees, and is quite sterile; but in a nursery garden at a few miles’ distance I saw humble-bees visiting the flowers, and they produced some capsules.” Mr. Darwin once stated that one might as well use organic dust as to endeavor to get seeds of *Linum perenne* by the aid of its own pollen. I found *Linum perenne* of our Rocky Mountains abundantly fertile with own-pollen, and said so in one of my papers. Mr. Darwin took this to be an attempt to discredit his observation, and naturally felt aggrieved. My thought is rather that plants and insects behave differently under different conditions, and that failure or facture in perfecting seeds should often be referred to phases of nutrition aside from the action of insects.

The facts here recorded afford a valuable lesson on this matter. *Lobelia syphilitica*, with its shorter and more open corolla, could be more easily rifled of its nectar, and as the flowers were in great abundance, and fresh flowers opened daily, the insects worked in the easiest lines. In the case of the *Sedum* it will also be noted that the bees continued their easier work on this, before seeking the more difficult *Lobelia*. The failure of Mr. Darwin’s *Lobelia* to produce, while mine were fertile, is obviously due to nutritive conditions. He was mistaken in referring the failure to the absence of insects, but no one would for a moment discredit his observation.